

of observations covering, or capable of being reduced to, the same period of observation." Buchan used 1,366 stations for the pressure maps, 1,620 for temperature, and 746 for the winds, the whole embodying all the information existing, every source being drawn upon.

The first attempt at a systematic atlas of meteorology was the meteorological section of the *Berghaus Physical Atlas*, first published in 1887, and revised in 1895. In 1899 appeared vol. III, *Meteorology*, of *Bartholomew's Physical Atlas*. The charts presented in the latter are chiefly those of Buchan. No attempt has ever been made to utilize the accumulated observations since the publication of Buchan's charts in anything like so comprehensive a manner as was done by him. New, and slightly modified, maps for January, July, and the year have been drawn by Hann, and in their latest form are found in his *Lehrbuch der Meteorologie*, 2d and 3d editions. Detailed charts of various countries, based on the greater part of the vast mass of data now available, have been issued by the several meteorological services; but these are not usually strictly comparable with one another. Indeed, vast as the existing body of observational material is, it is in such form that in its entirety it is available to no one, and would not be manageable by any single person even if it were available to him; a digest of all existing climatological data is urgently needed, and the preparation of such a digest, if properly managed, would be a perfectly feasible task. Many of the best regional maps are reproduced in *Bartholomew's Atlas* (l. c.), and some issued later are readily obtainable from the meteorological services of the respective countries. In addition there may be mentioned: Rykatchev, *Atlas Climatologique de l'Empire de Russie*, St. Petersburg, 1900; Ekholm, *Sveriges temperaturförhållanden jämförda med det ofriga Europas*, Ymer, 1899; Teisserenc de Bort, *Annales du Bur. Cent. Met.*, 1881, vol. IV, pp. 1-13, Paris, 1883; and the publications of the recent polar expeditions, e. g., Mohn, *Norwegian North Polar Expedition*, vol. VI, 1905 and Simpson, *British Antarctic Expedition, Meteorology*, vol. I, 1919; H. C. Dunwoody, *Summary of the International Meteorological Observations* (1878-1887, incl.), U. S. Weather Bureau Bull. A, 1893.

The best existing maps for France and adjacent regions are those of A. Angot in his *Études sur la climat de la France* (temperature, *Ann. Bur. Cent.*, 1903; pressure, *ibid.*, 1906; winds, *ibid.*, 1907), based on the data 1851-1900. The best available charts for Europe in general, and especially for Poland, are those in two notable publications, recently received from the latter country, by Gorczyński,<sup>6</sup> also for the period 1851-1900. New maps for the entire globe are also presented in these latter books, but the data used are not so reliable, particularly as regards homogeneity.

A very excellent series of small world charts is contained in the British Meteorological Office's *Barometer Manual for the Use of Seamen*, 9th ed., 1919; they are based on most of the data at present available.

The mapping of the ocean areas presents problems of its own. The isograms of the North Atlantic on Buchan's charts were based on the published international observations; those for the other oceans depended mainly upon coastal and island observations; the collection of marine meteorological data has gone steadily forward since the international congress of 1853, and has been continually utilized for the construction of marine meteorological charts published by the governments of

the various maritime nations. In 1909 the U. S. Weather Bureau commenced the publication of a series of monthly charts of each ocean, based on practically all available data; after a few years their publication was continued, in a somewhat modified form, by the Hydrographic Office, and they have been reprinted, unchanged, each month since. This series constitutes probably the best of all such charts.

It seems to have fallen to the lot of the Dutch, however, to make the most comprehensive digest of the marine observations. In publication No. 104 of the Koninklijk Nederlandsch Meteorologisch Instituut appear monthly charts of the Indian Ocean utilizing the observations made from 1856-1912; and similar charts for the North Atlantic are now in process of publication.<sup>7</sup>

Special mention should also be made of the unique (and only) marine meteorological atlas, *Atlas de Météorologie Maritime, publié à l'occasion de l'Exposition Maritime Internationale*, Paris, 1887; which contains, besides the extensive text, Teisserenc's de Bort's pressure and wind charts of the globe, Brault's wind charts of the North Atlantic, surface water temperature maps, and numerous special charts.—*Edgar W. Woolard.*

<sup>7</sup> See Kon. Ned. Met. Inst., No. 110, *Oceanographische en Meteorologische Waarnemingen in den Atlantischen Oceaan, 1<sup>ste</sup> deel*, Januari, Februari, 1870-1914; 1,562,463 observations were utilized for this publication. (Reviewed, p. 412, below.)

#### NEW ISOTHERMAL CHARTS OF POLAND, EUROPE, AND THE GLOBE.

In a notable work by Władysław Gorczyński, recently received from Poland,<sup>1</sup> and which must have been largely prepared within sound of the guns during the World War, the distribution of temperature over Poland and over Europe is dealt with in great detail.

After a harmonic analysis of the diurnal variation of temperature at a number of stations in Poland, and at many localities widely scattered over the world, the question of the determination of true means is discussed. Annual and monthly means, and departures from the means, are formed for the period 1851-1900 at numerous stations in Poland and at 26 stations in Europe and Asia. The day-to-day variation of temperature is also discussed. This interdiurnal variation shows two maxima and two minima each year (in Poland these usually occur in January and May and in April and September, respectively); and its 10-year means for long records show a 30-year and 5-year period, the latter probably identical with Schuster's 4.8 year sun-spot period.

Probable errors and mean deviations are treated, and correlations made between the monthly means at one station and those at a number of other stations. Such correlations are greater and extend to greater distances in winter than in summer.

Detailed monthly and annual isothermal charts are then presented for Poland, for Europe, and for the entire globe, based on the data 1851-1900, with references to the literature used. Anomalies, extremes, amplitudes, etc., are charted and discussed. Finally, a detailed treatment of all the different systems of classification of climates which have been proposed is given, and applied to the climatology of Europe and the world. The volume closes with a sketch of the geography and climatology of Poland, having for its object the justification of the claim that Poland is entitled to recognition as a separate and distinct independent country.—*E. W. W.*

<sup>6</sup> Władysław Gorczyński, *O Klimacie Powietrza w Polsce i w Europie*, Warszawa, 1917; and *Nowe Izotermie Polski, Europy i kuli Ziemskiej*, Warszawa, 1918.

<sup>1</sup> W. Gorczyński, *Nowe Izotermie Polski, Europy, i kuli Ziemskiej* (Nouvelles Isothermes de la Pologne, de l'Europe, et du Globe terrestre), Warsaw, 1918.